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Tracy et al.

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(54) **TISSUE POTENCY DETERMINATION
THROUGH QUANTITATIVE
HISTOMORPHOLOGY ANALYSIS**

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(58) **Field of Classification Search**

CPC G06K 9/00147
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,766,944 A 6/1998 Ruiz
2007/0264269 A1 11/2007 Harmon et al.
(Continued)

OTHER PUBLICATIONS

Markert ML et al., 2010, "Thymus transplantation," Clin Immunol., 135(2): 236-46.

(Continued)

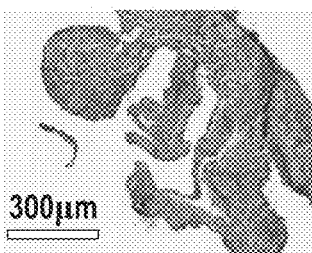
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(57) **ABSTRACT**

Systems and methods for performing quantitative histopathology analysis for determining tissue potency are disclosed. According to some embodiments, a method training a tissue classifier is provided. According to the method, training the tissue classifier includes generating feature fingerprints of detected nuclei within slide images in a control library and clustering the slide images based on their corresponding feature fingerprints. According to some embodiments, a method for utilizing the trained tissue classifier is provided. According to the method, the trained tissue classifier determines whether tissue in an unknown slide image corresponds to slide images clustered during the training of the tissue classifier.

60 Claims, 61 Drawing Sheets
(33 of 61 Drawing Sheet(s) Filed in Color)



Unclassified
slide image

